**Mr. Alpert’s Advanced Physics Galileo Ramp Lab Requirements**

1. Title of Lab (see above) Note: All reports shall be written in MLA format.
2. Purpose: To determine a formula that will accurately predict the acceleration of a marble down a ramp at different angles using the Sine of the angle.
3. Hypothesis: If the Sine of the angle of a ramp is known then the acceleration of the marble down the ramp will be in direct proportion to that figure with respect to the acceleration due to gravity.
4. Variables:
5. Independent variable (you fill this in)
6. Dependent variable (you fill this in)
7. Controlled variable (you fill this in)
8. Background: use the internet to research how Galileo used a rolling ball on a ramp to determine “g” Specifically you should include:  
    How Galileo made the ramps  
    How he timed the rolling balls  
    How he arrived at the use of the Sine of the angle as the determinant for the diminution of “g” with the angle (the derivation of his formula)

Any other significant facts related to his investigation.

1. Data tables as collected in class and drawn on our whiteboard. Be sure to include the time for the marble to roll down the ramp.
2. Graphs: Use the data you collected in class to create graphs in either Excel or Google docs as follows:
3. Speed vs. height graphs (speed is the x axis).
4. Calculations:

Use the formula derived in class **a = 240/ t^2** to determine the acceleration of the marble at the given angles.

1. Graph the acceleration of the marble according to the formula above against the value determined by taking the **Sine of the ramp angle times 980 cm/sec^2**

(If this is not a straight line, then suggest another value for 240 which will make the two numbers comply)

1. Verify your equation by predicting how long it will take a marble to roll down the ramp at an angle of 52 degrees. Build this ramp and report your results with percent error.
2. Wrap up questions:

Answer the questions contained in the original lab as follows

1. DYGIT (Did You Get It?): Four ramps are shown in the drawing below.  Which choice correctly compares the ramps by a marble’s speed when it rolls off?  Explain.

|  |  |
| --- | --- |
| * 1. C > D > A > B   2. C = D > A = B   3. A = B = C = D   4. B > A > D > C | https://docs.google.com/a/latinpcs.org/drawings/d/slYe_ZzYX5zxJ0Vhkg64xmg/image?w=385&h=150&rev=1&ac=1 |

1. What is the formula for PE?
2. What is the formula for KE?
3. Where does the marble have the greatest PE?
4. Where does the marble have the greatest KE?
5. The Law of Conservation of energy states that at any point on the ramp, the total energy is conserved (the same). Explain
6. Equate the PE at the top of the ramp to the KE at the bottom of the ramp (we did this in Freshman Year) and derive a formula for the final velocity.
7. Conclusion
8. What are your sources of error?
9. Why did we include a “fudge” factor, raising 180 to 240 in the formula to determine “a” ?
10. Did we prove our hypothesis?
11. What would your next steps be in improving on this lab or continuing your investigation?
12. Works cited